Attachment 2 – Drought Impacts

Drought Impacts

The Kings Basin has already experienced six of the drought impacts listed in Question 1, including additional drought related impacts. The region relies on snowpack and surface water runoff to sustain the already critically overdrafted groundwater aquifer. The following demonstrates how each of the impacts has occurred within the region, and the projects included in this application that will address this item.

At risk of not meeting existing drinking water demands

- The region is nearly entirely dependent on groundwater to meet drinking water demands. The aquifer is sustained by the snowpack, runoff, and surface water delivered to the region. The lack of surface supply has caused groundwater levels to drop significantly.
- The KBWA includes more the 82 community water systems. Of this total, 1/3 (27 of the 82) are single source systems, dependent on one well. With drought conditions, the depth to groundwater is dropping because of increased pumping, and these communities are at significant risk of losing their supply if groundwater levels should drop below well depth, or well equipment depth.
- CID's project is located near the City of Parlier, a Disadvantaged Community that relies solely on groundwater and is experiencing rapidly declining groundwater levels in its supply wells. As the water level declines, the capacity of the well declines. The decline in groundwater levels also causes migration of contaminant concerns common to the area, such as DBCP, and Nitrate in some areas.
- Another sign of the impact of the 2014 Drought on the severely disadvantaged community of East Orosi is that the water level in the wells in East Orosi have dropped more than 22 feet for the period between Spring 2012 and Spring 2014 indicating an average decline of 11 feet per year. Should the drought continue in 2015, a further drop in the water table could cause draw down in the two wells causing the pumps to pump air. This could leave the community with an inadequate water supply, requiring costly modifications to the wells, and potentially lowering the pumps and likely limiting the available pumping capacity.
- In some areas of the region such as the community of Monson in Tulare County, groundwater levels have already declined so much that private wells are no longer producing water. A recent news story covered the situation, (see **Attachment 2j**). Monson is located approximately 3 miles away from Sultana and approximately 5 miles away from East Orosi.
- The County of Tulare reports that drastic nature of the drought has caused a series of system shut downs due to low water pressure and emergency repairs or power outages, requiring residents to boil water and bath with buckets (see **Attachment 2k**).

At risk of not meeting existing agricultural water demands

- In 2013, CID did not make surface water deliveries to growers because of the dry year conditions. Now in 2014, as conditions have worsened, the District is facing its second straight year of no deliveries. Groundwater levels are dropping throughout the District, as evidenced by recent groundwater level information (see **Attachment 3c**). Groundwater conditions near the project have been quantified through collection of recent groundwater data from onsite borings completed to groundwater, measurements and review of hydrographs for CID monitoring wells near the site, and Depth to Groundwater maps which can be found in the attached Feasibility Study (see **Attachment 4b**).
- In 2014, regional surface water deliveries are anticipated to be only 525,000 AF (about 31%). 2014 will be the 5th lowest runoff year on record for the Kings Basin region, and the average over the past 3 years will likely be the lowest or next to lowest 3-year period on record. According to the Kings Basin Integrated Groundwater and Surface Water Model (IGSM), agricultural demand within the Kings Basin Water

Authority service area is approximately 2.3 million acre-feet (MAF). In order to sustain the aquifer and meet demands, an estimated 1.7 to 1.9MAF of surface water supply is needed.

At risk of not meeting ecosystem water demands

- Waterfowl habitat is reduced or eliminated because there is no available surface water for delivery to recharge basins during the summer months within the region (including Fresno, FMFCD and CID basins).
- The Kings River Fisheries Management Program becomes more difficult to maintain during drought years because the water diverted for fisheries management flows is a greater percentage of the limited surface supplies of the District's that commit their supply to sustain the program.

Drinking water MCL violations

- Within the Kings region, the primary water quality concerns for many of the communities, particularly DACs, are Arsenic, Nitrate and Total Coliform. Within the region, approximately 10% (8 of 82) of the permitted community water systems have had an MCL exceedance for Arsenic, about 10% (8 of 82) with Nitrate exceedances, and about 11% (9 of 82) with Total Coliform exceedances.
- East Orosi relies on two 250gpm wells to supply water to its approximately 500 residents. Both wells produce water that at times exceeds the MCL for nitrate.
- Sultana CSD relies on one primary well for all supply and has one standby well that produces water exceeding the MCL for DBCP and barely under the MCL for nitrate.
- Recently the community of Seville (located just 4-5 miles south of East Orosi and Sultana) had to issue a "do not drink" water notice because of high nitrate levels caused by declining groundwater levels. The Seville well had been producing water just under the MCL for the last couple of years but just recently water quality has declined as the groundwater level declined.

Groundwater basin overdraft

- Surface water conveyed and delivered to growers within the region helps sustain the aquifer, and there is extensive groundwater recharge within the region that helps to replenish the aquifer by capturing flood water when available. As drought conditions persist, the lack of surface water delivered to areas within the region, combined with the increased groundwater pumping to meet agricultural and municipal demands causes groundwater levels to drop, impacting wells in the area. The region is already classified as critically overdrafted and ranked as a High Priority basin by DWR.
- Site specific depth to water data was also collected during a subsurface investigation in May 2014. Water level in the one boring was about 59 feet. Previous depth to water information on a regional scale is available from groundwater maps prepared by Kings River Conservation District, the Fresno Area-Regional Groundwater Management Plan and the Department of Water Resources for the springs of 2005, 2009, and 2011. These maps show that depth to water was about 40 feet below ground surface (bgs) in the vicinity in the springs of 2005 and 2009, and appears to be between 40 to 50 feet in spring 2011. As indicated above, groundwater is currently about 59 feet. With the continuance of the drought into the 2014 growing season and summer demand on local groundwater resources to meet crop water needs, it is quite likely that groundwater levels will continue to decline in the area.
- The City of Fresno's primary source of water is groundwater from the Fresno Sole Source Aquifer. Multi-year drought and historical use have resulted in a state of critical overdraft for the aquifer. Below the City water surface elevations range from less than 190 to more than 300 feet above mean sea level. A large cone of depression extends from Herndon Avenue to Jensen Avenue in the North-South direction and from Maple to Brawley Avenues in the east-west direction. In general, groundwater levels have declined by an average of about 1.5 feet per year since 1990. In the last 80+ years, Fresno's water level has dropped from less than 30 feet below ground surface in 1930, to more than 120 feet and deeper below ground surface recently.

- Perhaps the greatest sign of the impact of the 2014 Drought on the severely disadvantaged community of East Orosi is that the water level in both of the community two water system's wells is declining. Recent historical groundwater level data for monitoring wells in the East Orosi area show a drop of 22 feet for the period between Spring 2012 and Spring 2014 indicating an average decline of from 11 feet per year. A further drop in the water table should the drought continue into 2015 could cause draw down in the two wells to where the pumps would pump air or run dry.

Table 2-1: Project Proponents Depth to Ground Water (feet) in East Orosi Vicinity Monitoring Well[1]						
Well Number	Location	Spring 2012	Fall 2012	Spring 2013	Fall 2013	Spring 2014
T143A	1/2 mile SSW	27.1	37.4	35.3	47.9	49

- Recent historical groundwater level data for monitoring wells in the Sultana area show a drop of roughly 30 feet in both of these monitoring wells for the period between Fall 2011 and Spring 2014 indicating an average decline of 13 to 14 feet per year. The standing water levels in Well #2 and Well #3 were 72 and 97 feet below ground level surface respectively when recorded on May 5, 2014. Should the drought continue into 2015, a further drop in the water table could cause draw down in the primary well to pump air, potentially leaving the community with an inadequate water supply and a dependence on the backup well that produces water exceeding the Maximum Contaminant Level for DBCP.

Table 2-2: Project Proponents Depth to Ground Water (feet) in Sultana Vicinity Monitoring Well[1]							
Well Number	Location	Fall 2011	Spring 2012	Fall 2012	Spring 2013	Fall 2013	Spring 2014
M115A	Rd 104 & Ave 416	36.1	39.1	48	47.9	64.5	66
O114A	1 mile South	24	27	41	35	52	55.5

Discharge water TMDL violations

- There are no anticipated TMDL violations that will be impacted by the drought, however the drought does have the potential for increased risk of TMDL violations, specifically:
    - The drought has resulted in a significant reduction of native vegetation and cover in local watersheds.
    - The lack of vegetation tends to result in higher surges of storm water runoff during the beginning of the rainfall season. These early season surges have the potential for increased constituent and sediment runoff, which can degrade water quality and result in TMDL violations.
    - Drought conditions have also increased the potential for earlier and more frequent wildfires, further exasperating the potential for TMDL violations due to the lack of vegetative cover.
    - After a watershed wildfire, the first rains are often referred to as "black rain" due to the amount of black ash that flows into the waterways.

[1] Source: Alta Irrigation District Data Base

Other drought related adverse impacts

- Regional Economic Impacts. The region maintains a primarily agricultural-based economy that depends on water for agricultural planting and production. Without water supply, production is reduced, creating limited farm labor needs and work opportunities. Limited work opportunities have created increased demand for governmental assistance and long lines waiting for food giveaways. **Attachment 2i** shows that the California Farm Water Coalition estimates the following impacts, a significant portion of which will occur with this region:
    - Agriculture industry decline will be $1.7b
    - 60% of the economic losses will occur in the San Joaquin Valley
    - 14,500 seasonal and full time jobs lost
    - Household income decline of $555M
    - Fallowing of 410,000 acres, which will lead to higher food prices and fewer consumer choices

- Within CID, all of the communities rely solely on groundwater for supply to meet demands. The increased use of groundwater increases operational costs, impacting the cost of production and local economy.

- Increased energy consumption caused by increased pumping of groundwater, taxing the power grid and increasing associated energy production impacts.

Table 2-3 below shows each drought impact that applies to the project proponent; each impact is described in further detail in Attachment 3.

Table 2-3: Drought Related Impacts

Drought Impact	Project A: CID	Project B: FMFCD	Project C: Fresno	Project D: EOCSD	Project E: SCSD
At risk of not meeting existing drinking water demands	X	X	X	X	X
At risk of not meeting existing agricultural water demands	X	N/A	N/A	N/A	N/A
At risk of not meeting ecosystem water demands	X	X	X	N/A	N/A
Drinking water MCL violations	N/A	N/A	N/A	X	X
Groundwater basin overdraft	X	X	X	X	X
Discharge water TMDL violations					
Other drought related adverse impacts	X	X	X	X	X

Water Conservation Measures

All of the five project proponents have implemented water conservation measures. Three of the applicants (City of Fresno, East Orosi, and Sultana CSD) are domestic water purveyors. The Consolidated Irrigation District is a surface water supplier to agricultural users. The Fresno Metropolitan Flood Control District is not a water purveyor. The following lists the existing and planned water conservation measures planned by each project proponent.

Existing and Planned Water Conservation Measures

Consolidated Irrigation District

DWR's website for Agricultural Water Use Efficiency (http://www.water.ca.gov/wateruseefficiency/agricultural/) lists 3 primary water conservation measures for Irrigation District System Improvement for Districts like CID: Canal Lining, Canal Structure Improvements, and Remote Monitoring and Control. CID has implemented all three, most recently initiating a District-wide telemetry system that includes canal gate automation and flowrate monitoring. CID has also recently completed numerous canal structure improvements including canal lining to provide improved water management and delivery efficiency. The District is working to implement all applicable efficient water management practices. The District and the growers in the District have implemented several efficient water management practices including:

- Alternate Land Use
- On-Farm Irrigation Capital Improvements
- Incentive Pricing Structure
- Infrastructure Improvements
- Order/Delivery Flexibility
- Supplier Spill and Tailwater Systems
- Automated Canal Controls
- Conjunctive Use
- Customer Pump Test/Evaluation
- Identify Institutional Changes

In 2013, because of dry year conditions, the District decided to forego deliveries and carry over some supply in preparation of 2014. With the drought declaration in 2014, the District is facing its second straight year of no deliveries. Growers within the District are converting to drip or micro-sprinkler systems to conserve water delivered, and the District is tracking that conversion.

CID has entered into agreements with the local cities within its boundaries to assist them with mitigating groundwater overdraft prior to allowing new developments. CID provides water conservation and water supply information to growers in the District though email announcements and their online news letter.

CID's project is located near the City of Parlier which has instituted watering restrictions, as well as utilized grant funding to institute a drought impact water use efficiency program.

City of Fresno

Since 2009 the City has implemented water conservation measures that have reduced the average daily water usage more than 20% from 329 gallons per person per day to less than 250 gallons per person per day. Recent installation of water meters and volumetric pricing have indicated more than 21% reduction in usage. The City has implemented voluntary water conservation through its City of Fresno Water Conservation Program (FWCP). FWCP was started by the City in 1981, and has been actively promoting activities that reduce water usage through water conservation. The City leads the way for the region in terms of water conservation efforts and communication. The following lists just some of the programs and measures that the City has implemented:

- Summer/Winter Watering Schedules
- Water usage surveys and consultation

- Leak detection and reporting
- Water conservation tips and outreach programs
- Appliance efficiency rebate programs
- Landscape and irrigation recommendations
- Drought tolerant landscaping demonstrations and events

A list of activities performed this year is included as **Attachment 2a**, which also includes a listing of all of the materials developed and distributed and the conservation efforts over the last several years. The City Municipal Code contains a section on the wastage of water and water conservation measures (Section 6-520 Wastage of Water), which outlines the mandatory prohibitions and restrictions that are in place under normal water supply conditions in the City.

If the drought continues through 2014 and into 2015 the City of Fresno has options to reduce water usage even further through its Water Shortage Contingency Plan. This plan is implemented based on water shortage criteria outlined in the City of Fresno's 2010 Urban Water Management Plan (available online at http://www.fresno.gov/NR/rdonlyres/3795B9BD-E030-492D-8215-1A6654C1D932/0/TextFinal2010CityofFresnoUWMPNovember2012.pdf). Under the Water Shortage Contingency Plan the City would implement a Staged Water Reduction Plan. The plan is comprised of four stages of water usage reduction. Each water conservation stage includes specific water conservation measures and water reduction measures.

Fresno Metropolitan Flood Control District

FMFCD is not a water purveyor. However, FMFCD's flood control and urban drainage facilities provide water supply and water quality benefits by capturing an average of 90% of all urban runoff, essentially conserving local water supply to the region. FMFCD is an active participant in the Central Valley Water Awareness Committee which recently sponsored several water conservation events and efforts (see **Attachment 2b**). FMFCD promotes water conservation to help reduce runoff through its Clean Storm Water program. The Clean Storm Water Program includes outreach and education efforts to schools, business partnerships, and general public communication.

FMFCD is taking advantage of dry conditions to accelerate its basin maintenance schedule to make more basins ready for maximum water capture and recharge volume when rains do return. Removal of silts and sediments now will make the basins' soil more permeable, making the percolation of water through layers of soil to the aquifer faster. This advance maintenance work will help increase groundwater recharge in future years because accumulated silts and sediments can hinder recharge.

East Orosi CSD

The East Orosi Community Services District is taking actions to reduce water wastage. The District is including the attached "Save our Water" flyer (see **Attachment 2c**) with this year's distribution of the District's Consumer Confidence Report. The East Orosi CSD Board of Directors adopted a resolution urging voluntary water conservation measures within the community to help meet the 20% conservation objective set by the Governor (see **Attachment 2d**). East Orosi CSD will also be circulating a bilingual notice (see **Attachment 2e**) of voluntary water conservation measures to be taken related to the Governor's Declaration of a Drought Emergency.

Sultana CSD

The Sultana Community Services District has taken actions to reduce water wastage. The District has distributed the attached bilingual notice of the Governor's Declaration of a Drought Emergency with water conservation measure tips (see **Attachment 2f**). The Sultana CSD Board of Directors adopted a resolution urging voluntary water conservation measures within the community to help meet the 20% conservation objective set by the Governor (see **Attachment 2g**).

Kings Basin Water Authority

In addition to the project proponents, the KBWA has initiated efforts related to drought preparedness and impacts, including:

- Conducted a drought survey (see **Attachment 2h**). The drought survey was sent to all KBWA members and interested parties, and included 10 drought related questions. 19 agencies responded, and provided information as to what they are doing related to the drought. The results of the survey were circulated to KBWA members and interested parties, and provided at KBWA meetings.
- Provided email communication to the KBWA stakeholder email list regarding the statewide water conservation requirements and new regulations.
- 6 of the 15 Measurable Objectives in the IRWMP specifically target conservation and drought response. The table below lists those Measurable Objectives.

Table 2-4: Conservation and Drought Targeted Measurable Objectives

No.	Objective	Water Conservation/Drought Connection
MO1	Increase amount of groundwater in storage with intent to eliminate the groundwater overdraft in 20 years	Sustaining the aquifer that the region depends on during dry years through additional supply, water conservation and reduced demand
MO3	Identify DAC priority needs and promote/support solutions to DAC water issues	Water conservation and water supply is critical concern for DACs
MO4	Increase average annual supply and reduce demand	Will sustain the regions resources
MO5	Increase dry year supply	Provide additional supply in drought years
MO8	Encourage Best Management Practices, policies & education that protect water quality	Education efforts that should result in conservation and include drought awareness and efforts to conserve
MO15	Comply with SBx7-7	Meter installation and BMP implementation expected to result in water conservation